

Six new species of *Pheidole* Westwood from North Vietnam (Hymenoptera, Formicidae)

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Six new species of *Pheidole* Westwood from North Vietnam (Hymenoptera, Formicidae). - Six new species of *Pheidole* Westwood are described from North Vietnam: *Pheidole colpigaleata* sp. nov., *Pheidole fortis* sp. nov., *Pheidole foveolata* sp. nov., *Pheidole laevicolor* sp. nov., *Pheidole magna* sp. nov. and *Pheidole vulgaris* sp. nov. *Pheidole fortis* was collected also from North Thailand, and *Pheidole vulgaris* is widespread through the Indo-Chinese subregion.

Keywords: Ant - *Pheidole* - new species - Vietnam.

INTRODUCTION

Pheidole Westwood, belonging to the tribe Pheidolini in the subfamily Myrmicinae, is a dominant and hyperdiverse ant genus, having nearly 900 named species (Wilson, 2003). Wilson (2003) recently revised New World species of the genus, while Ogata (1982), Xu (1998), Zhou & Zheng (1999), Eguchi (1999, 2000, 2001a, b, 2003, 2004) and Eguchi *et al.* (2006) have contributed to taxonomy of Oriental species of the genus long after European and American pioneers in late 19th and early 20th.

Taxonomy of *Pheidole* is very poorly studied in Vietnam, one of the key areas for our understanding of biodiversity and biogeography in East and Southeast Asia: three species, *P. dugasi* Forel, *P. planifrons* Santschi and *P. tsailuni* Wheeler (replacement name for *P. concinna* Wheeler), have been described as new species (Forel, 1911; Santschi, 1920; Wheeler, 1928, 1929); and three other named taxa, *P. rhombinoda* Mayr, *P. rhombinoda* var. *micantiventris* Forel and *P. smythiesii* Forel, were reported in early 20th (Santschi, 1920; Wheeler, 1927). However, Yamane *et al.* (2003) reported eleven *Pheidole* species, of which half are undetermined, in their checklist of ants in Cuc Phuong N. P. (Ninh Binh Province). Thus, numerous undescribed species are undoubtedly embedded in Vietnam. Vietnamese and Japanese myrmecologists including me have conducted surveys on ant diversity in various localities in N. Vietnam since 1997 (e.g., Bui & Eguchi, 2003; Yamane *et al.*, 2003; Eguchi *et al.*, 2004). In the present article, as part of the results, I describe 6 new species with their bionomics.

METHODS

The following measurements and indices are frequently used in the present article: head length (HL, maximal length of head capsule); head width (HW, maximal

width of head capsule excluding eyes); length of gena (LG, distance between mandibular insertion and anterior margin of eye in profile); eye length (EL, length of maximal diameter of eye); scape length (SL, length of antennal scape excluding the basal condylar bulb); length of antennal segment X (LASX); mesosoma length (ML, diagonal length of mesosoma in profile from anterior margin of pronotum to posterior margin of propodeal lobe); length of hind femur (FL); cephalic index (CI = HW / HL x 100); scape index (SI = SL / HW x 100); hind femur index (FI = FL / HW x 100); ratio of length of postpetiole excluding helcium to length of petiole.

The terms "occipital carina", "occipital lobe" and "alitrunk" employed in Eguchi's previous publications (e.g., Eguchi, 1999, 2000, 2001a, b, 2004) are replaced with "preoccipital carina", "vertexal lobe" and "mesosoma" in the present paper.

Colonies collected by K. Eguchi are given a colony code, like Eg00-HK-31; those by Sk. Yamane like TH99-SKY-04; those by T. V. Bui and K. Eguchi like B&E03-8. Abbreviation of collectors are: Eg = Katsuyuki Eguchi; SKY = Seiki Yamane; BTV = Tuan Viet Bui; JRF = John R. Fellowes. Abbreviations of the specimen depositories follow those in Arnett *et al.* (1993), where available: IEBR, Entomological collection of the Institute of Ecology and Biological Resources, Hanoi, Vietnam; MHNG, Muséum d'histoire naturelle, Geneva, Switzerland; MCZC, Museum of Comparative Zoology, Harvard University, Cambridge, Massachusetts, USA; BMNH, Natural History Museum, London, UK; NHMW, Naturhistorisches Museum, Wien, Austria; FSKU, Entomological collection of Faculty of Science, Kagoshima University, Japan; ACEG, Ant Collection of Katsuyuki Eguchi (ant collection managed by Katsuyuki Eguchi, temporarily housed in FSKU).

DESCRIPTIONS

Pheidole colpigaleata sp. n.

Figs 1A-H

Pheidole sp. eg-113: Bui & Eguchi, 2003 (a list of local ant fauna); Eguchi *et al.*, 2004 (ecological study).

HOLOTYPE. - Major from colony Eg01-VN-222 (nesiting in a rotting twig). Type locality: Ba Vi N. P. (21°03'N, 105°22'E, ca. 1100 m alt.), Ha Tay, Vietnam [K. Eguchi leg., 11/xi/2001]. Depository: IEBR. **PARATYPES.** - 11 majors, 13 minors and 1 dealate queen from the same colony to which the holotype belongs. Depository: IEBR, MHNG, MCZC, BMNH, NHMW, FSKU, ACEG.

NON-TYPE MATERIAL EXAMINED. - Vietnam: *Lao Cai*: Y Linh Ho (a small fragment of forest, ca. 1100 m alt.), Sa Pa [Eg02-VN-219]; *Bac Giang*: W. Yen Tu N. P. (21°10'52.2"N, 106°43'41.3"E, ca. 195 m alt.) [B&E03-04]; *Ha Tay* (misspelled as "Ha Tai" on the labels): Ba Vi N. P. (21°03'N, 105°22'E, 1100-1200 m alt.) [Eg99-VN-130; Eg01-VN-213; Eg02-VN-038, -039]. Eguchi's informal species code "*Pheidole* sp. eg-113" has been applied to these specimens.

DIAGNOSIS. - Dorsal and lateral faces of head and alitrunk punctured and dull (minor); hypostoma with 3 conspicuous median processes in addition to the process just mesal to mandibular base (major); frontal carina well developed horizontally (major); promesonotal dome lacking a conspicuous prominence on its posterior declivity (major and minor).

DESCRIPTION. - Major: TL 2.9-3.5 mm, HL 1.21-1.29 mm, HW 1.16-1.24 mm, SL 0.60-0.63 mm, FL 0.74-0.78 mm, CI 92-96, SI 48-53, FI 61-66 (N=5); body reddish brown; head in full-face view very weakly convex laterad, shallowly and broady

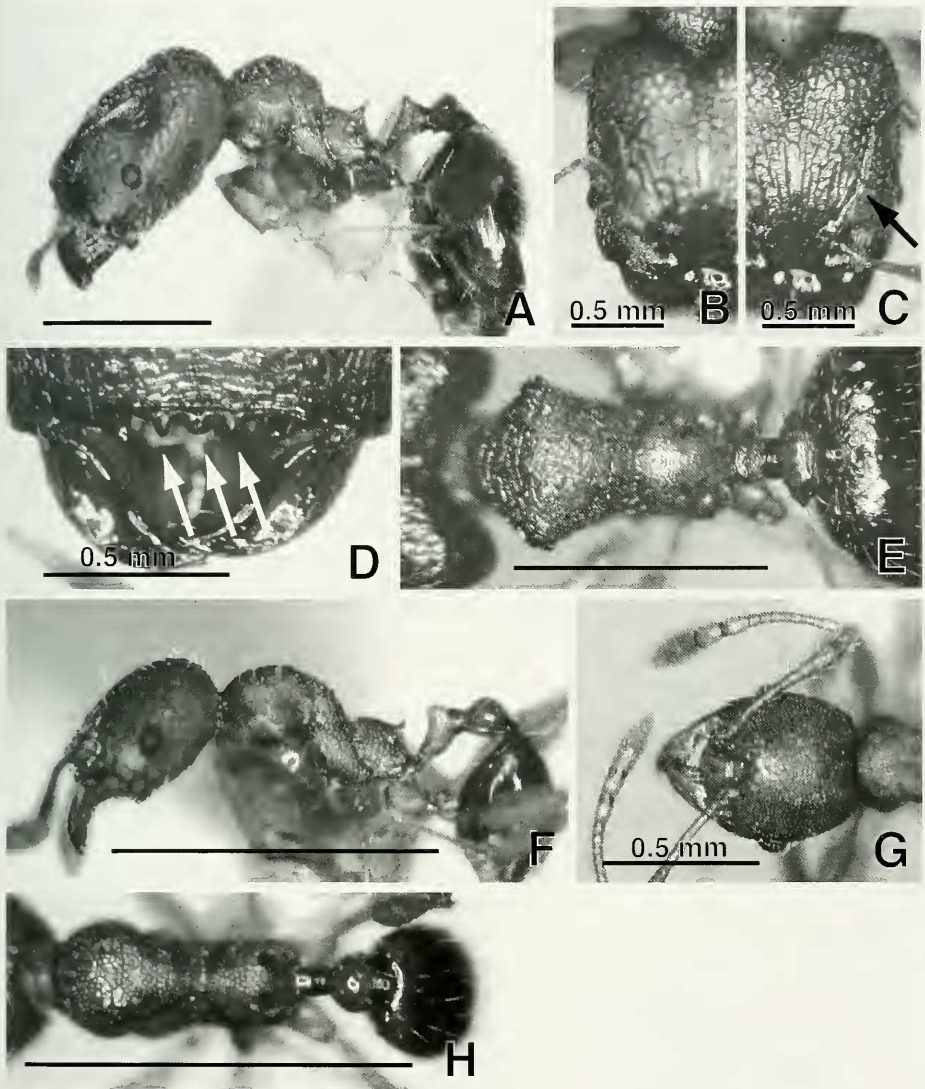


FIG. 1

Pheidole colpigaleata Eguchi sp. nov., type material. A-E, major; F-H, minor. A & F, body in profile; B, C & G, head in full-face view, arrow in C indicating frontal carina; D, median part of hypostoma, arrows indicating median processes; E & H, mesosoma in dorsal view. Scale bars = 1 mm, unless otherwise stated.

concave posteriorly, with an inconspicuous median groove from the concavity to frons, in profile hardly or very weakly impressed on vertex; anterior part of frons longitudinally rugose; posterior part of frons, vertex and dorsal and dorsolateral faces of vertexal lobe reticulate, with enclosures very weakly punctured; frontal carina well developed horizontally, partly overhanging antennal scrobe; median part of clypeus

almost smooth, without a median longitudinal carina; hypostoma with 3 median processes in addition to the process just mesal to each mandibular base (lateral processes); lateral processes well developed, as large as lateral ones of the three median processes; antenna with a 3-segmented club; scape exceeding midlength of head; $EL \gg LASX$; LG 1.5-1.7 times as much as EL ; promesonotal dome without a prominence on its posterior declivity; dorsolateral part of the dome weakly produced laterad; dorsum of the dome punctured reticulate, with enclosures very weakly punctured; lateral face of the dome, higher part of mesopleuron and lateral face of propodeum punctured and dull; lower part of mesopleuron punctured (sometimes only very weakly); propodeal spine finger-shaped or elongate-triangular, narrowly or sometimes moderately based; petiole much longer than postpetiole (excluding helcium); petiolar node in anterior view not or very weakly concave dorsally; postpetiole not massive, 1.9-2.2 times as broad as petiolar node; first gastral tergite largely smooth and shining except a weakly punctured area around its articulation with postpetiole.

Minor: TL 1.7-1.8 mm, HL 0.53-0.58 mm, HW 0.50-0.54 mm, SL 0.51-0.56 mm, ML 0.72-0.79 mm, FL 0.53-0.58 mm, CI 91-95, SI 98-106, FI 106-110 ($N=5$); body deep yellowish-brown; head punctured and dull dorsally and laterally, except anteromedian part of frons dimly punctured; preoccipital carina evanescent or very weak dorsally; median part of clypeus smooth and shining, without a median longitudinal carina; antenna with a 3-segmented club; scape usually exceeding posterior margin of head by the length of second antennal segment or more; $EL \approx LASX$; mesosoma punctured well and dull over the surface; dorsum of promesonotal dome often overlain by weak rugulae; promesonotal dome in profile without a prominence on its posterior declivity, very weakly produced dorsolaterally; propodeal spine small and thin; petiole longer than postpetiole (excluding helcium); postpetiole somewhat globular, 2.0-2.2 times as broad as petiolar node; first gastral tergite smooth and shining.

REMARKS. - This species is very similar to *Pheidole nodgii* Forel and its relatives, e.g., *P. tjibodana* Forel, *P. magretti* Emery and *P. retivertex* Eguchi, but is well distinguished from the latter which have hypostoma with only one well-developed process (in *P. colpigaleata* hypostoma with three conspicuous median processes). This species is also similar to *Pheidole rabo* Forel, *P. zoceana*, Santschi and *P. parva* Mayr, but is also well distinguished from the latter which have frontal carinae almost absent or vestigial (in *P. colpigaleata* well developed). *Pheidole colpigaleata* actually has a mixture of characteristics seen in *P. rabo* and *P. nodgii*.

DISTRIBUTION. - N. Vietnam.

BIONOMICS. - This species inhabits forest from lowland to hilly areas (ca. 1100 m alt.), and nests in rotting twigs and small wood fragments. Colony Eg01-VN-222 stored a lot of small seeds inside the nest.

Pheidole fortis sp. n.

Figs 2A-I

Pheidole sp. eg-160: Bui & Eguchi, 2003 (a list of local ant fauna).

HOLOTYPE. - Major from colony Eg02-VN-264. Type locality: Cat Cat (a trail to Mt. Phansipan, ca. 1300-1400 m alt.), Sa Pa, Lao Cai, Vietnam [K. Eguchi leg., 3/v/2002]. Depository: IEBR. PARATYPES. - 1 major and 19 minors from the same colony to which the holotype belongs. Depository: IEBR, MHNG, MCZC, BMNH, NHMW, FSKU, ACEG.

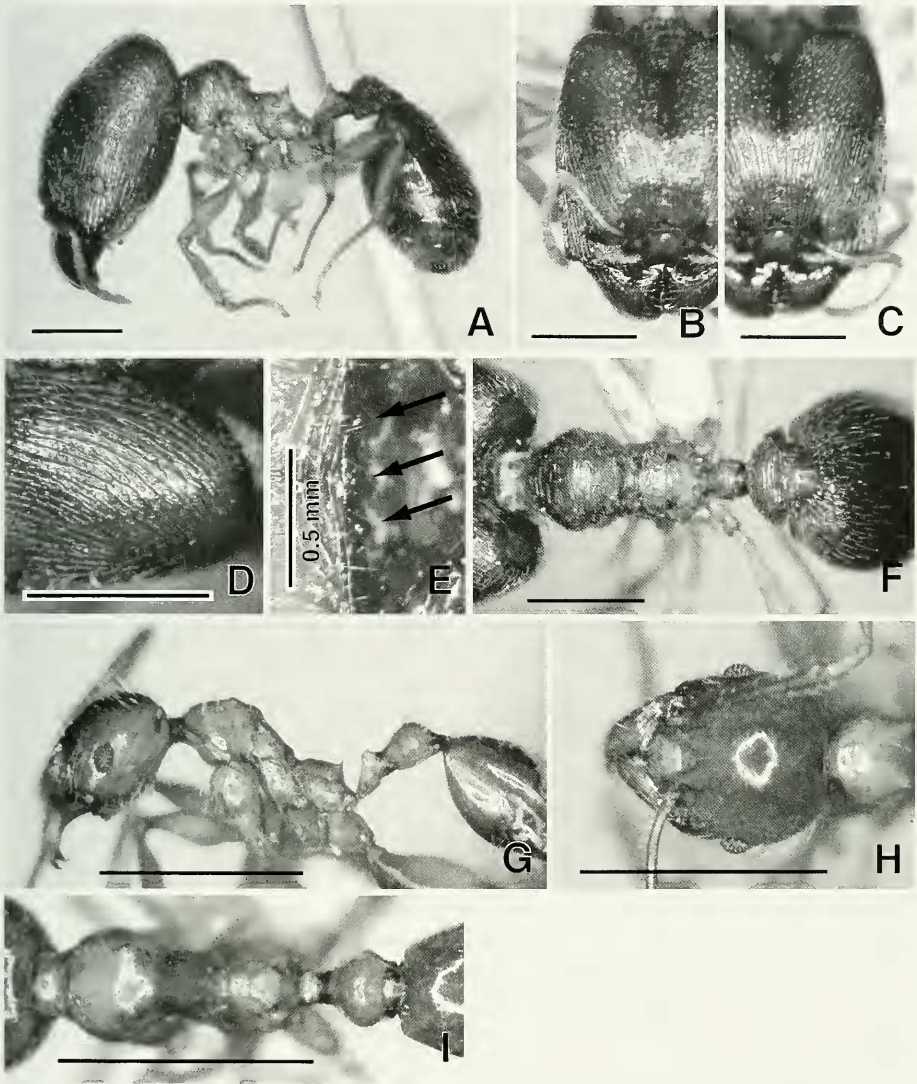


FIG. 2

Pheidole fortis Eguchi sp. nov., type material. A-F, major; G-I, minor. A & G, body in profile; B, C & H, head in full-face view; D, vertexal lobe in dorsolateral view; E, median part of hypostoma, arrows indicating median processes; F & I, mesosoma in dorsal view. Scale bars = 1 mm, unless otherwise stated.

NON-TYPE MATERIAL EXAMINED. - Vietnam: *Vinh Phuc*: Tam Dao N. P., ca. 950 m alt. [SKY, 2001]. Thailand: *Chiang Mai*: Doi Pui, ca. 1200 m alt., Doi Suthep-Pui N. P. [Eg01-TH-113]. Eguchi's informal species code "*Pheidole* sp. eg-160" has been applied to these specimens.

DIAGNOSIS. - Head densely covered with short decumbent to subdecumbent hairs entirely (major); frons with longitudinal rugulae which run toward posterolateral

corner of vertexal lobes (major); promesonotal dome lacking a conspicuous prominence on its posterior declivity (minor); postpetiole massive (major and minor).

DESCRIPTION. - Major: TL 4.4-4.8 mm, HL 2.12-2.23 mm, HW 1.79-2.05, SL 0.90-0.91 mm, FL 1.33-1.39 mm, CI 84-92, SI 44-51, FI 67-78 (N=4); body reddish-brown with paler alitrunk and appendages; head in full-face view very weakly convex laterad, broadly and deeply concave posteromedially, in profile not impressed on vertex, densely covered with short decumbent to subdecumbent hairs entirely; frons with longitudinal rugulae which run toward posterolateral corner of vertexal lobes; frontal carina and antennal scrobe absent; median part of clypeus with a median longitudinal carina; hypostoma with a pair of low processes and an inconspicuous process (a total of three median processes) in addition to the process just mesal to each mandibular base (lateral processes); lateral processes conspicuous, but smaller than lateral ones of the three median processes; antenna with a 3-segmented club; scape just reaching or a little exceeding midlength of head when it laid backward; EL \geq LASX; LG 1.8-2.2 times as much as EL; promesonotal dome sparsely rugose transversely, with interspaces smooth and shining, with a much reduced prominence on its posterior declivity; lower part of mesopleuron smooth and shining often with several rugulae; lateral face of propodeum with rugulae; propodeal spine short, narrowly based; petiole as long as postpetiole (excluding helcium); petiolar node in anterior view shallowly and broadly concave dorsally; postpetiole massive, 2.2-2.5 times as broad as petiolar node, with an angle laterally; at least anterior 1/3 of first gastral tergite rugoso-punctured.

Minor: TL 2.3-2.8 mm, HL 0.71-0.75 mm, HW 0.64-0.71 mm, SL 0.79-0.87 mm, ML 1.01-1.07 mm, FL 0.92-0.97 mm, CI 90-95, SI 118-124, FI 134-144 (N=5); body yellowish-brown with paler appendages; head in full-face view oval, smooth and shining over the surface; median part of clypeus almost smooth and shining, often with a median longitudinal carina; preoccipital carina complete but weak dorsally; antenna with a 3-segmented club; scape extending far beyond posterolateral margin of head; EL < LASX; promesonotal dome smooth and shining, in profile without a conspicuous prominence on its posterior declivity, with an inconspicuous mound dorsolaterally; lower part of mesopleuron smooth and shining largely; lateral face of propodeum very weakly punctured; propodeal spine small, elongate-triangular, narrowly based; petiole shorter than postpetiole (excluding helcium); postpetiole massive, 2.1-2.5 times as broad as petiolar node.

REMARKS. - This species is similar to *Pheidole wroughtoni* Forel (the type material housed in MHNG was examined), but well distinguished from the latter by the following characteristics: in the major of the latter vertex and dorsum of vertexal lobe in profile forming an obtuse angle; in the minor of the latter EL > LASX; the minor of the latter having a conspicuous prominence on the posterior declivity of promesonotal dome. The minor of this species is similar to that of *Pheidole magna* sp. n. (see below), but the latter has a conspicuous prominence on the posterior declivity of promesonotal dome.

DISTRIBUTION. - N. Vietnam and N. Thailand.

BIONOMICS. - This species inhabits open forests and forest edges in hilly areas (900-1400 m alt. in N. Vietnam). It nests in the soil.

Pheidole foveolata sp. n.

Figs 3A-H

Pheidole sp. eg-163: Bui & Eguchi, 2003 (a list of local ant fauna).

HOLOTYPE. - Major from colony Eg02-VN-210 (nesting in the soil). Type locality: Y Linh Ho (a small fragment of forest, ca. 1100 m alt.), Sa Pa, Lao Cai, Vietnam [K. Eguchi leg., 1/v/2002]. Depository: IEBR. PARATYPES. - 19 majors, 21 minors and 1 dealate queen from the same colony to which the holotype belongs. Depository: IEBR, MHNG, MCZC, BMNH, NHMW, FSKU, ACEG.

NON-TYPE MATERIAL EXAMINED. - Vietnam: *Lao Cai*: Y Linh Ho (a small fragment of forest, ca. 1100 m alt.), Sa Pa [Eg02-VN-220, -227]. Eguchi's informal species code "*Pheidole* sp. eg-163" has been applied to these specimens.

DIAGNOSIS. - Dorsal and lateral faces of head and alitrunk punctured and dull (minor); median part of clypeus smooth and shining (minor); hypostoma with 3 conspicuous median processes in addition to the process just mesal to mandibular base (major); promesonotal dome lacking a conspicuous prominence on its posterior declivity (major and minor); propodeal spine much reduced to a small dent (minor).

DESCRIPTION. - Major: TL 2.1-2.8 mm, HL 0.93-0.97 mm, HW 0.91-0.97 mm, SL 0.46-0.49 mm, FL 0.56-0.58 mm, CI 98-101, SI 48-54, FI 60-62 (N=6); body deep yellowish brown to brown; head in full-face view weakly convex laterad, weakly broadly concave posteriorly, with a weak median groove from the concavity to frons, in profile very weakly impressed on vertex; frons longitudinally rugose; vertex and dorsal and lateral faces of vertexal lobe weakly reticulate, with enclosures punctured and dull; frontal carina vestigial just as rugulae; antennal scrobe absent; median part of clypeus almost smooth, without a median longitudinal carina; hypostoma with 3 median processes in addition to the process just mesal to each mandibular base (lateral processes); lateral processes relatively well developed, as large as or a little smaller than lateral ones of the three median processes; antenna with a 3-segmented club; scape a little exceeding midlength of head; EL>LASX; LG 1.4-1.6 times as much as EL; promesonotal dome without a prominence on its posterior declivity; dorsolateral part of the dome weakly produced laterad; dorsum of the dome punctured at least weakly and dull, overlain with weak and irregular rugulae; lateral face of the dome and lower part of mesopleuron almost smooth and shining; lateral face of propodeum dimly or weakly punctured, often with rugulae; propodeal spine elongate-triangular, broadly based; petiole much longer than postpetiole (excluding helcium); petiolar node in anterior view not concave mediodorsally; postpetiole not massive, 1.7-1.8 times as broad as petiolar node; first gastral tergite largely smooth and shining except a weakly punctured area around its articulation with postpetiole.

Minor: TL 1.3-1.7 mm; HL 0.47-0.51 mm; HW 0.42-0.46 mm, SL 0.42-0.45 mm, ML 0.62-0.66 mm, FL 0.42-0.47 mm, CI 89-94, SI 98-102, FI 100-102 (N=6); body light brown to brown; head punctured and dull dorsally and laterally; preoccipital carina absent dorsally; median part of clypeus smooth and shining, usually with a weak or very weak median longitudinal carina; antenna with a 3-segmented club; scape exceeding posterior margin of head by half to full length of second antennal segment; EL a little more than LASX; mesosoma punctured well and dull over the surface; promesonotal dome in profile without a prominence on its posterior declivity; propodeal spine much reduced to a tiny dent (at most as long as maximal diameter of propodeal spiracle); petiole much longer than postpetiole (excluding helcium); post-

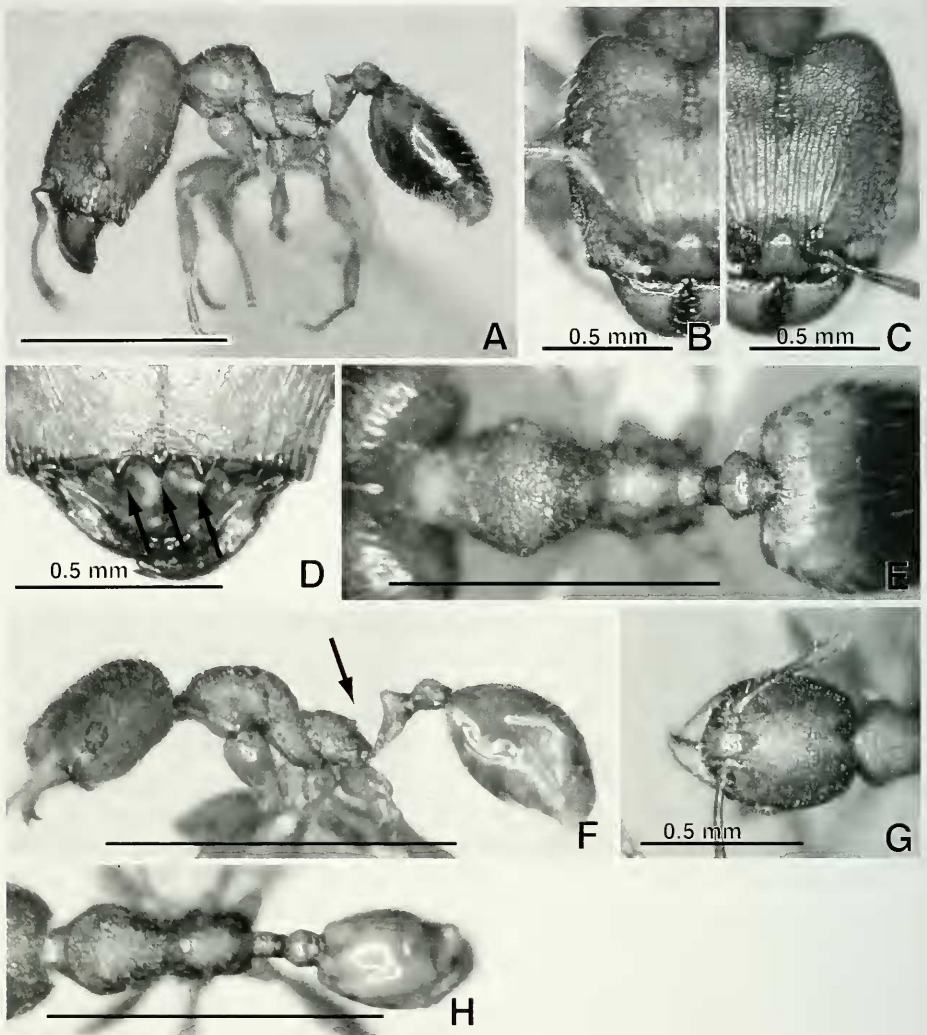


FIG. 3

Pheidole foveolata Eguchi sp. nov., type material. A-E, major; F-H, minor. A & F, body in profile, arrow in F indicating propodeal spine; B, C & G, head in full-face view; D, median part of hypostoma, arrows indicating median processes; E & H, mesosoma in dorsal view. Scale bars = 1 mm, unless otherwise stated.

petiole not massive, 1.4-1.5 times as broad as petiolar node; first gastral tergite smooth and shining.

REMARKS. - This species is similar to *Pheidole mus* Forel and *P. sagei* Forel (the type material of both species housed in MHNG was examined) and *P. parva* Mayr (the type material housed in NHMW was examined) but distinguished from the latter three by the following characteristics: the minor of the latter three having an elongate-trian-

gular propodeal spine which is more developed than in the new species; the minor of *P. mus* having median portion of clypeus which is punctured weakly or dimly and not shining.

DISTRIBUTION. - N. Vietnam.

BIONOMICS. - This species inhabits forest edges (ca. 1100 m alt.), and nests in the soil.

Pheidole laevicolor sp. n.

Figs 4A-G

Pheidole sp. eg-114: Eguchi *et al.*, 2004 (ecological study).

HOLOTYPE. - Major from colony Eg01-VN-130. Type locality: Tam Dao N. P. (21°27'N, 105°38'E, ca. 1000 m alt.), Vinh Phuc, Vietnam [K. Eguchi leg., 6/xi/2001]. Depository: IEBR. PARATYPES. - 14 majors and 15 minors from the same colony to which the holotype belongs. Depository: IEBR, MHNG, MCZC, BMNH, NHMW, FSKU, ACEG.

NON-TYPE MATERIAL EXAMINED. - Vietnam: *Thái Nguyen*: My Yen Commune Forest (21°35'N, 105°36'E), Na Hau Village [Eg01-VN-160]; *Bac Giang*: W. Yen Tu N. P. (21°10-11'N, 106°43-44'E, 170-415 m alt.) [B&E03-01, -30, -40]; *Ha Tay* (misspelled as "Ha Tai" on the labels): Ba Vi N. P. (21°03'N, 105°22'E, 1100-1200 m alt.) [Eg99-VN-129, Eg02-VN-033]. Eguchi's informal species code "*Pheidole* sp. eg-114" has been applied to these specimens.

DIAGNOSIS. - Dorsal and lateral faces of head and promesonotal dome smooth and shining (minor); vertex and dorsal and lateral faces of vertexal lobe reticulate, with enclosures punctured and dull (major); hypostoma with 3 conspicuous median processes in addition to the process just mesal to mandibular base (major); promesonotal dome at most with an inconspicuous prominence on its posterior declivity (major and minor).

DESCRIPTION. - Major: TL 2.5-3.1 mm, HL 1.06-1.20 mm, HW 0.98-1.08 mm, SL 0.49-0.55 mm, FL 0.86-0.76 mm, CI 90-92, SI 50-52, FI 67-72 (N=5); head in full-face view very weakly convex laterad, broadly concave posteriorly, in profile weakly or hardly impressed on vertex; frons longitudinally rugose; vertex and dorsal and lateral faces of vertexal lobe reticulate, with enclosures punctured and dull; frontal carina very weak or vestigial just as rugulae; antennal scrobe absent; median part of clypeus almost smooth, sometimes with an inconspicuous median longitudinal carina; hypostoma with 3 median processes in addition to the process just mesal to each mandibular base (lateral processes); lateral processes well developed, as large as lateral ones of the three median processes; antenna with a 3-segmented club; scape exceeding midlength of head to some extent; EL>LASX; LG 1.4-1.7 times as much as EL; promesonotal dome without a prominence on its posterior declivity; dorsolateral part of the dome weakly produced laterad; anterodorsal, mediodorsal and lateral faces of the dome almost smooth and shining, often sparsely with weak rugulae; mesopleuron and lateral face of propodeum weakly punctured, often with a smooth area on the lower part of mesopleuron; propodeal spine elongate-triangular, sometimes with a blunt apex, narrowly or moderately based; petiole much longer than postpetiole (excluding helcium); petiolar node in anterior view weakly or very weakly concave dorsally; postpetiole not massive, in dorsal view usually produced well laterad, 1.7-1.9 times as broad as petiolar node; first gastral tergite weakly punctured on its anterior 1/4-1/3; body deep yellowish brown, with darker gaster and paler appendages.

Minor: TL 1.6-2.1 mm, HL 0.50-0.58 mm, HW 0.42-0.50 mm, SL 0.47-0.58 mm, ML 0.65-0.79 mm, FL 0.49-0.62 mm, CI 84-88, SI 108-116, FI 117-124

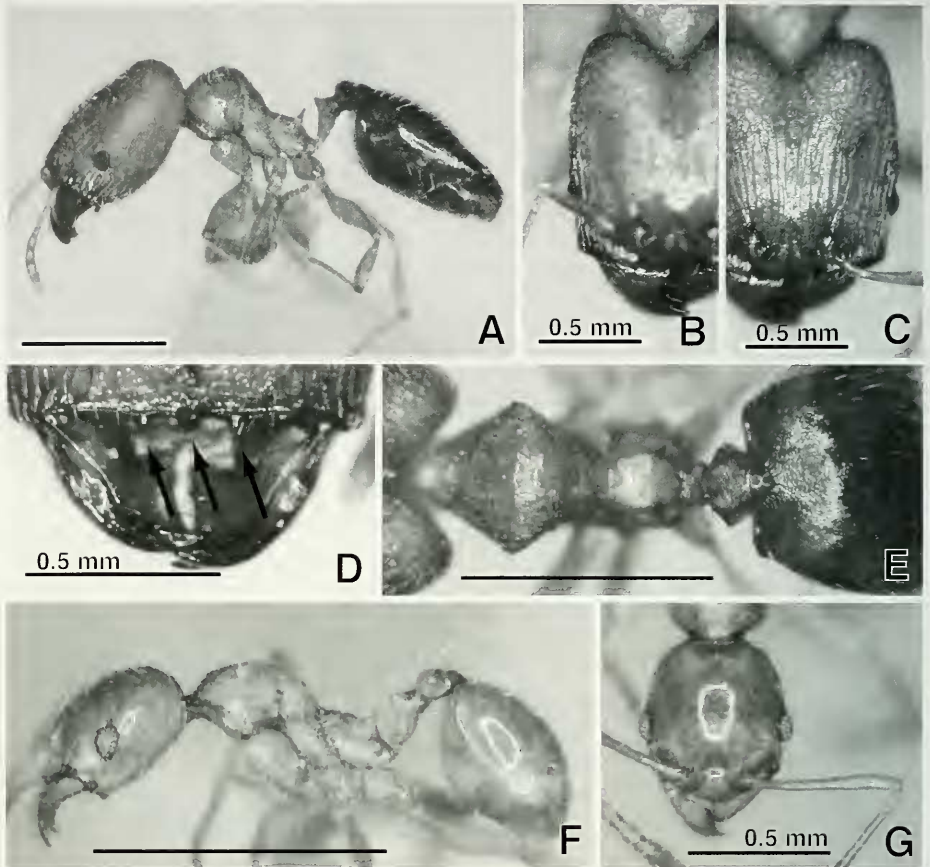


FIG. 4

Pheidole laevicolor Eguchi sp. nov., type material. A-E, major; F & G, minor. A & F, body in profile; B, C & G, head in full-face view; D, median part of hypostoma, arrows indicating median processes; E, mesosoma in dorsal view. Scale bars = 1 mm, unless otherwise stated.

(N=5); body yellowish brown; head smooth and shining; preoccipital carina complete but very weak dorsally; median part of clypeus smooth and shining, without a median longitudinal carina; antenna with a 3-segmented club; scape exceeding posterior margin of head at least by half length of second antennal segment; EL as much as or a little more than LASX; promesonotal dome largely smooth and shining, with several weak rugulae anterodorsally, in profile without or with an inconspicuous prominence on its posterior declivity; mesopleuron and lateral face of propodeum weakly punctured; propodeal spine elongate-triangular, narrowly based; petiole much longer than postpetiole (excluding helcium); postpetiole not massive, 1.5-1.9 times as broad as petiolar node; gaster smooth and shining.

REMARKS. - This species is very similar to *P. rinae taipoana* Wheeler but distinguished from the latter by the following characteristics: the major of the latter

having area in front of a transverse impression on vertex sparsely with weak longitudinal rugulae, with interspaces smooth and shining, and the vertexal impression deep.

DISTRIBUTION. - N. Vietnam.

BIONOMICS. - This species inhabits forests (including forest edges) from lowlands to hilly areas (up to 1200 m alt. in N. Vietnam), and nests in the soil (see also Eguchi *et al.*, 2004).

Pheidole magna sp. n.

Figs 5A-I

Pheidole sp. eg-162: Bui & Eguchi, 2003 (a list of local ant fauna).

HOLOTYPE. - Major from colony Eg02-VN-137 (nesting in the soil of shoulder of a road). Type locality: Bang Khoang (Site-A: ca. 1700-1800 m alt.), Sa Pa, Lao Cai, Vietnam [K. Eguchi leg., 27/iv/2002]. Depository: IEBR. PARATYPES. - 34 majors and 35 minors from the same colony to which the holotype belongs. Depository: IEBR, MHNG, MCZC, BMNH, NHMW, FSKU, ACEG.

NON-TYPE MATERIAL EXAMINED. - Vietnam: *Lao Cai*: Sa Pa town [Eg02-VN-087]; Bang Khoang (Site-A: a stream-side secondary forest), ca. 1700-1800 m alt., Sa Pa [Eg02-VN-116, -124, -129]; Bang Khoang (Site-B: a well-developed forest) [Eg02-VN-165, -169, -175]; Sa Seng (a small fragment of limestone forest), Sa Pa [Eg02-VN-280]; *Ha Tay*: Ba Vi N. P. [BTV, 2002]. Eguchi's informal species code "*Pheidole* sp. eg-162" has been applied to these specimens.

DIAGNOSIS. - Vertexal lobe largely smooth and shining (major); promesonotal dome having a conspicuous prominence on its posterior declivity (major and minor); postpetiole relatively massive (major and minor).

DESCRIPTION. - Major: TL 4.6-6.1 mm, HL 2.21-2.39 mm, HW 2.13-2.32 mm, SL 1.04-1.14 mm, FL 1.59-1.66 mm, CI 92-99, SI 45-51, FI 70-75 (N=6); body deep yellowish-brown or reddish-brown, with paler alitrunk and/or appendages; head in full-face view weakly convex laterad, broadly and deeply concave posteromedially, in profile very weakly impressed or not impressed on vertex; frons and vertex longitudinally rugose; vertexal lobe largely smooth and shining; frontal carina and antennal scrobe absent; median part of clypeus with a median longitudinal carina; hypostoma with 2 processes and one very low or vestigial process (a total of 3 median processes) in addition to the process just mesal to each mandibular base (lateral processes); lateral processes much reduced, much smaller than lateral ones of the three median processes; antenna with a 3-segmented club; scape a little exceeding midlength of head when it laid backward; EL a little more than LASX; LG ca. 1.7-2.0 times as much as EL; promesonotal dome sparsely rugose transversely, with interspaces smooth and shining, with a conspicuous prominence on its posterior declivity; the prominence extending as a transverse ridge; lower part of mesopleuron smooth and shining at least medially; lateral face of propodeum weakly punctured, or almost smooth with several rugulae; propodeal spine small, narrowly based; petiole as long as postpetiole (excluding helcium); petiolar node in anterior view not or very shallowly concave dorsally; postpetiole relatively massive, 2.3-2.5 times as broad as petiolar node; first gastral tergite smooth and shining, often with a weakly punctured area just around its articulation with postpetiole.

Minor: TL 2.7-3.3 mm, HL 0.87-0.94 mm, HW 0.79-0.90 mm, SL 0.94-1.03 mm, ML 1.15-1.34 mm, FL 1.12-1.22 mm, CI 91-96, SI 113-122, FI 134-143 (N=7); body yellowish-brown or deep yellowish-brown, with paler appendages; head in full-face view oval, smooth and shining over the surface; median part of clypeus smooth

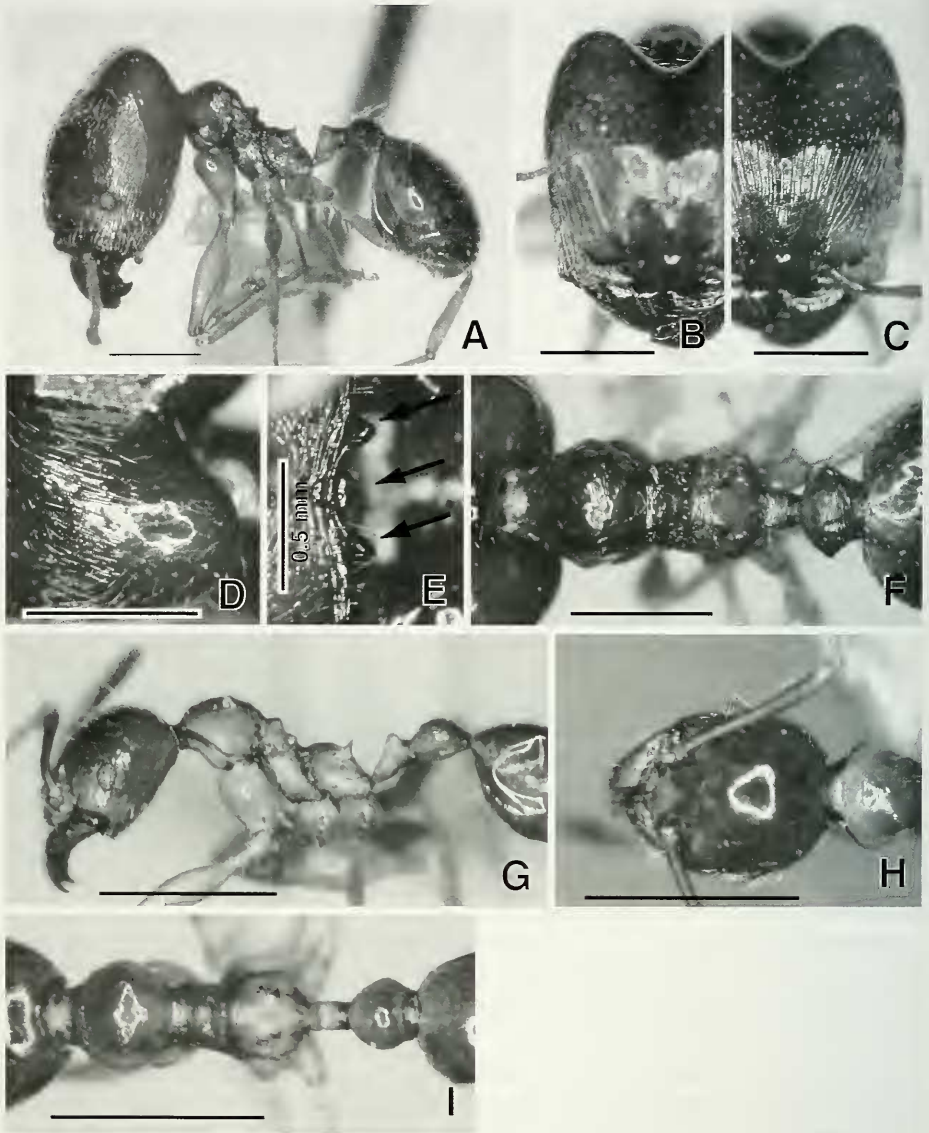


FIG. 5

Pheidole magna Eguchi sp. nov., type material. A-F, major; G-I, minor. A & G, body in profile; B, C & H, head in full-face view; D, vertexal lobe in dorsolateral view; E, median part of hypostoma, arrows indicating median processes; F & I, mesosoma in dorsal view. Scale bars = 1 mm, unless otherwise stated.

and shining, with a median longitudinal carina on its anterior half; preoccipital carina complete but weak dorsally; antenna with a 3-segmented club; scape extending far beyond posterolateral margin of head; $EL < LASX$; promesonotal dome smooth and

shining, in profile relatively well convex in front of a conspicuous prominence on its posterior declivity, with an inconspicuous mound dorsolaterally; mesopleuron and lateral face of propodeum largely punctured weakly; propodeal spine elongate-triangular, narrowly based; petiole a little shorter than postpetiole (excluding helcium); postpetiole relatively massive, 2.3-2.5 times as broad as petiolar node.

REMARKS. - This large-bodied species is similar to *Pheidole dugasi* Forel, but well distinguished from the latter by the following characteristics: the major of the latter having vertexal lobes distinctly rugose and first gastral tergite entirely rugoso-punctured.

DISTRIBUTION. - N. Vietnam.

BIONOMICS. - This species occurs from relatively open habitats to forests in hilly areas (1000-1800 m alt.), and nests in the soil and rotting logs.

Pheidole vulgaris sp. n.

Figs 6A-I

Pheidole sp. eg-111: Yamane *et al.*, 2003 (a list of local ant fauna); Bui & Eguchi, 2003 (a list of local fauna); Eguchi *et al.*, 2004 (ecological study).

HOLOTYPE. - Major from colony Eg01-VN-155. Type locality: My Yen Commune Forest (21°35'N, 105°36'E), Na Hau Village, My Yen Commune, Thai Nguyen, Vietnam [K. Eguchi leg., 8/xi/2001]. Depository: IEBR. PARATYPES. - 19 majors and 20 minors from the same colony to which the holotype belongs. Depository: IEBR, MHNG, MCZC, BMNH, NHMW, FSKU, ACEG.

NON-TYPE MATERIAL EXAMINED. - China: *Guangxi*: Dayaoshan N. R., Jinxiu [JRF, 1998, Bottle #Eg38-36]; *Guangdong*: Dawuling N. R., Maoming [JRF, 1997, Bottle #Eg38-38]; *Hong Kong*: Taipo Kau N. P., New Territories [JRF, 1993, Bottle #Eg38-31]. Vietnam: *Lao Cai*: Y Linh Ho (a small fragment of forest, ca. 1100 m alt.), Sa Pa [Eg02-VN-214, -230]; Cat Cat (a trail to Mt. Phansipan, ca. 1300-1400 m alt.), Sa Pa [Eg02-VN-265]; *Thai Nguyen*: My Yen Commune Forest (21°35'N, 105°36'E), Na Hau Village [Eg01-VN-155]; *Bac Giang*: W. Yen Tu N. P. (21°10'15.6-18.1"N, 106°43'09.6"-16.0E, ca. 370-415 m alt) [B&E03-41, -52, -56, -57]; *Quang Ninh*: Ky Thuong N. R. (21°11'14.9"N, 107°07'08.5"E, ca. 105 m alt.) [B&E03-73]; *Vinh Phuc*: Tam Dao N. P. (21°27'N, 105°38'E, 800-1100 m alt.) [Eg99-VN-002, -034, -043; Eg01-VN-112]; *Ha Tay* (misspelled as "Ha Tai" on the labels excluding those of Eg01-VN-234); Ba Vi N. P. (21°03'N, 105°22'E, 400-800 m alt. [Eg99-VN-085, -089, -093, -103, -120; Eg01-VN-209, -224, -234; Eg02-VN-027, -048]; *Ninh Binh*: Cuc Phuong N. P. (20°14'N, 105°36'E, 320 m alt.) [Eg01-VN-193, -195]. Thailand: *Chiang Mai*: Doi Suthep-Pui N. P., 800-900 m alt. [Eg01-TH-079 (W. Jaitrong leg., 1997)]; *Nakhonratchasima*: Khao Yai N. P. [TH00-SKY-34]. India: *Utter Pradesh*: Rajaji N. P. [A. Schulz & K. Vock leg., 1996]. Eguchi's informal species code "*Pheidole* sp. eg-111" has been applied to these specimens.

DIAGNOSIS. - Vertex and vertexal lobe largely smooth, or with weak and interrupted rugoso-reticulation directing posterolateral corner of the lobes and rarely with interspaces punctured (major); head and promesonotal dome smooth and shining (minor); hypostoma with 2 conspicuous processes and one very low or vestigial process in addition to the process just mesal to mandibular base (major); EL<LASX (minor); promesonotal dome lacking a conspicuous prominence on its posterior declivity (major and minor).

DESCRIPTION. - Major: TL 2.5-3.4 mm, HL 1.18-1.38 mm, HW 1.06-1.21 mm, SL 0.60-0.68 mm, FI 0.81-0.94 mm, CI 86-91, SI 53-59, FI 75-81 (N=11); body deep yellowish brown or brown (rarely dark brown), often with paler alitrunk and/or gaster; head in full-face view very weakly convex laterad, broadly concave posteromedially, in profile not impressed on vertex; dorsal surface of head variable in sculpture; frons

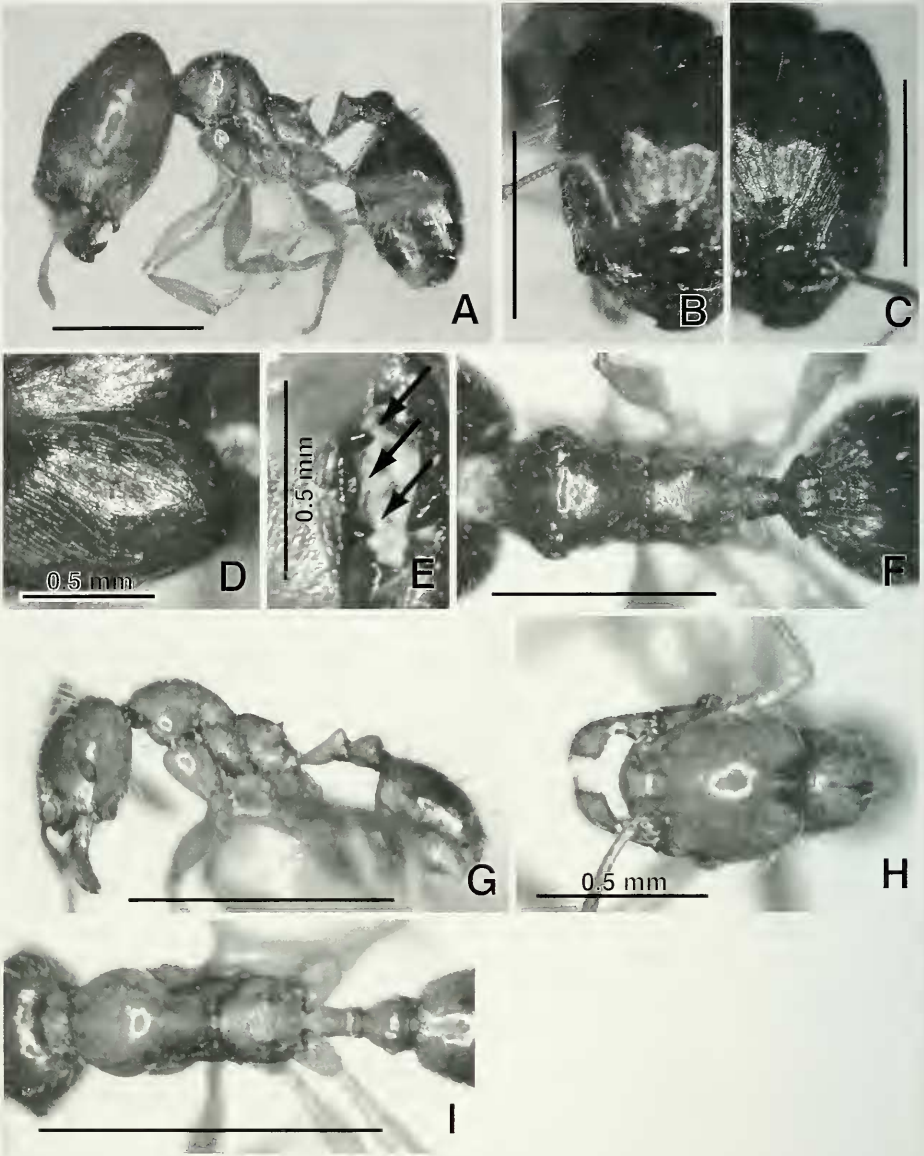


FIG. 6

Pheidole vulgaris Eguchi sp. nov., type material. A-F, major; G-I, minor. A & G, body in profile; B, C & H, head in full-face view; D, vertexal lobe in dorsolateral view; E, median part of hypostoma, arrows indicating median processes; F & I, mesosoma in dorsal view. Scale bars = 1 mm, unless otherwise stated.

obliquely rugose to largely smooth and shining with sparse interrupted and irregular rugulae; vertex and vertexal lobe largely smooth, or weakly and interruptedly rugose/rugoso-reticulate toward posterolateral corner of the lobes and rarely with

interspaces punctured; frontal carina absent or at most vestigial just as rugulae; antennal scrobe absent; median part of clypeus almost smooth and shining, rarely with an evanescent median longitudinal carina; hypostoma with 2 conspicuous processes and one very low or vestigial process (a total of 3 median processes) in addition to the process just mesal to each mandibular base (lateral processes); lateral processes well-developed, as large as lateral ones of the three median processes; antenna with a 3-segmented club; scape exceeding midlength of head; $EL \geq LASX$; LG 1.4-1.9 times as much as EL; promesonotal dome smooth and shining, often with several weak rugulae; the dome at most with an inconspicuous prominence on its posterior declivity; dorso-lateral part of the dome only very weakly produced; mesopleuron and lateral face of propodeum weakly punctured, or largely smooth and shining; propodeal spine elongate-triangular, usually with a blunt apex, narrowly based; petiole much longer than postpetiole (excluding helcium); petiolar node in anterior view usually very weakly concave dorsally; postpetiole not massive, 1.6-2.0 times as broad as petiolar node; first gastral tergite very weakly punctured at least around its articulation with postpetiole.

Minor: TL 1.7-2.0 mm, HL 0.54-0.61 mm, HW 0.46-0.53 mm, SL 0.52-0.61 mm, ML 0.75-0.84 mm, FL 0.57-0.67 mm, CI 85-91, SI 108-117, FI 116-127 (N=11); body yellowish brown; head smooth and shining; preoccipital carina complete but weak dorsally; median part of clypeus smooth and shining, without a median longitudinal carina; antenna with a 3-segmented club; scape exceeding posterior margin of head by the length of second antennal segment or more; $EL < LASX$; promesonotal dome largely smooth and shining, in profile without a prominence on its posterior declivity; mesopleuron punctured; lateral face of propodeum very weakly punctured or almost smooth; propodeal spine small, elongate-triangular, narrowly based; petiole much longer than postpetiole (excluding helcium); postpetiole somewhat globular but not massive, 1.7-2.1 times as broad as petiolar node; gaster smooth and shining.

REMARKS. - This species is very similar to *P. rinae taipoana* Wheeler and *P. laevicolor* sp. n. but well distinguishable from them by the following characteristics: the major of the latter two has a reticulate dorsum of the vertexal lobe; and the minor of the latter two has a maximal diameter of the eye that is as long as or a little longer than the 10th antennal segment. This species is also similar to *P. woodmasoni* (the type material deposited in MHNG was examined; the syntype minors presumably lost), but the major of the former is well distinguished from that of the latter by the following characteristics: head in full-face view only very weakly concave posteriorly, convexity of promesonotal dome relatively weak, and propodeal spine short and relatively broadly based in the latter.

DISTRIBUTION. - Widespread in the Indo-Chinese subregion: S. China, N. Vietnam, N. Thailand and India (Utter Pradesh).

BIONOMICS. - This species ranges from forest edges to well-develop forests, from lowlands to hilly areas (up to 1400 m alt. in N. Vietnam), and nests in the soil (see also Eguchi *et al.*, 2004). Colony Eg01-VN-112 includes dozens of dealate queens. This species probably forms super-colonies at least occasionally.

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REFERENCES

- ARNETT, R. H. JR., SAMUELSON, G. A. & NISHIDA, G. M. 1993. The Insect and Spider Collections of the World (2nd ed.). *Sandhill Crane Press, Inc., Gainesville, Florida*, 310 pp.
- BOLTON, B. 1995. A new general catalogue of the ants of the world. *Harvard University Press, Cambridge (Mass.) & London*, 504 pp.
- BUI, T. V. & EGUCHI, K. 2003. Ant survey in Hoang Lien Son Nature Reserve, Lao Cai, N. Vietnam. *International Network for the Study of Asian Ants, DIWPA. ANeT Newsletter* 5: 4-11.
- EGUCHI, K. 1999. *Pheidole longipes* (Fr. Smith) and two new closely related species from Kinabalu Park, Sabah, Borneo (Hymenoptera, Formicidae). *Japanese Journal of Systematic Entomology* 5: 97-104.
- EGUCHI, K. 2000. Two new *Pheidole* species with a 5-segmented antennal club (Hymenoptera: Formicidae). *Entomological Science* 3: 687-692.
- EGUCHI, K. 2001a. A taxonomic study on Asian *Pheidole* (Hymenoptera, Formicidae): new synonymy, rank changes, lectotype designations and redescriptions. *Insecta Koreana* 18: 1-35.
- EGUCHI, K. 2001b. A revision of the Bornean species of the ant genus *Pheidole* (Insecta: Hymenoptera: Formicidae: Myrmicinae). *Tropics Monograph Series* 2: 1-154.
- EGUCHI, K. 2003. A study on the male genitalia of some Asian species of *Pheidole* (Hymenoptera, Formicidae, Myrmicinae). *Sociobiology* 41: 317-355.
- EGUCHI, K., 2004. Taxonomic revision of two wide-ranging Asian ants, *Pheidole fervens* and *P. indica* (Insecta: Hymenoptera, Formicidae, Myrmicinae), and related species. *Annalen des Naturhistorischen Museums in Wien* 105B: 189-209.
- EGUCHI, K., BUI, T. V. & YAMANE, Sk. 2004. A preliminary study on foraging distance and nesting sites of ants in Indo-Chinese lowland vegetation (Insecta, Hymenoptera, Formicidae). *Sociobiology* 43: 445-457.
- EGUCHI, K., YAMANE, Sk. & ZHOU, S. Y. 2006. Taxonomic revision of the *Pheidole rinae* Emery complex (Hymenoptera, Formicidae). - A step toward a revision of the Oriental *Pheidole* -. *Memoirs of the American Entomological Institute* 77. (In press)
- FOREL, A. 1911. Ameisen aus Ceylon, gesammelt von Prof. K. Escherich (einige von Prof. E. Bugnion) (pp. 213-228). *In: ESCHERICH, K. (ed). Termitenleben auf Ceylon. Gustav Fischer, Jena, XXXII+262 pp.* (Indirectly cited from BOLTON, 1995)
- OGATA, K. 1982. Taxonomic study of the ant genus *Pheidole* Westwood of Japan, with a description of a new species. *Kontyû* 50: 189-197.

- SANTSCHI, F. 1920. Fourmis d'Indo-Chine. *Annales de la Société Entomologique de Belgique* 60: 158-176.
- WHEELER, W. M. 1927. Ants collected by Professor F. Silvestri in Indochina. *Bolletino del Laboratorio de Zoologia generale e agraria R. Scuola Superiore di Agricoltura di Portici* 20: 83-106.
- WHEELER, W. M. 1928. Ants collected by Professor F. Silvestri in China. *Bollettino del Laboratorio di Zoologia generale e agraria del R. Istituto Superiore agrario di Portici* 22: 3-38.
- WHEELER, W. M. 1929. Some ants from China and Manchuria. *American Museum Novitates* 361: 1-11.
- WILSON, E. O. 2003. *Pheidole in the New World - A Dominant, Hyperdiverse Ant Genus*. Harvard University Press, Cambridge, Massachusetts, London, England, 794 pp.
- XU, Z. H. 1998. Seven species of the ant genus *Pheidole* Westwood newly recorded in China (Hymenoptera: Formicidae). *Journal of Southwest Forestry College* 18: 227-235. (In Chinese)
- YAMANE, Sk., BUI, T. V., OGATA, K., ÔKIDO, H. & EGUCHI, K. 2003. Ant fauna of Cuc Phuong National Park, North Vietnam (Hymenoptera: Formicidae). *Bulletin of the Institute of Tropical Agriculture, Kyushu University* 25 (2002): 51-62.
- ZHOU, S. Y. & ZHENG, Z. M. 1999. Taxonomic study of the ant genus *Pheidole* Westwood from Guangxi, with descriptions of three new species (Hymenoptera: Formicidae). *Acta Zootaxonomica Sinica* 24: 83-88. (In Chinese)